

State of Wisconsin/Department of Transportation
RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: Jun 30, 2003

Program: SPR-0010(36) FFY99		Part: II Research and Development	
Project Title: Effect of Pavement Thickness on Superpave Mix Permeability and Density		Project ID: 0092-02-14c	
Administrative Contact: Nina McLawhorn		Sponsor:	
WisDOT Technical Contact: Error! Bookmark not defined.		Approved Starting Date: Nov 7, 2001	
Approved by COR/Steering Committee: \$225,321.00		Approved Ending Date: Nov 7, 2004	
Project Investigator (agency & contact): Jeff Russell: UW-Madison			

Description: It is well recognized that density that could be achieved in the field is significantly affected by the maximum aggregate size of aggregates, the gradation, and the lift thickness. It is also well known that permeability of asphalt mixtures is a function of aggregate gradation, density achieved, and distribution of air voids. With the shift in mixture designs to Superpave methods, gradations on the coarse side of the maximum density line are being widely recommended and used. These gradations are unique in their densification characteristics and are claimed to be more permeable. It is not clear whether this trend is due to changes in the air voids distribution, the lower densities being achieved, or both. This trend is of special importance to Wisconsin as the shift to Superpave mixtures is underway.

Wisconsin has traditionally used 75-mm dense graded HMA overlays placed in two lifts, a 44-mm binder lift and a 31-mm surface lift. These lift thicknesses are based on the traditional rule that lift thickness be twice the maximum aggregate size. Starting in the year 2000, Wisconsin has decided to move from Marshall design to Superpave mixture design.

Superpave mixes tend to be harder to compact. Additionally, Superpave guidelines recommend the lift thickness be a minimum of 3 times the nominal maximum aggregate size. This poses two problems for Wisconsin:

1. The first is that the current design criteria for overlay thickness will result in thin-lifts of Superpave mixes that the AASHTO Lead States Committee has reported as having problems with pavement permeability and achieving pavement density.
2. The second is that these mixes may be impossible to compact in the field contributing to the permeability problem, even though they meet laboratory density criteria.

There is a need, therefore, for a study to evaluate the potential problems and to establish procedures to relate laboratory density to field study and to estimate or measure permeability during mixture design. The study also needs to define the relationship between lift thickness and aggregate gradations that will minimize the densification problem and address the permeability concerns.

Total Study Budget	Current FFY Budget	Expenditures for Current Quarter	Total Expenditures to Date	Percent Complete
\$225,321.00	\$56,330.25	\$15,984.92	\$56,170.00	55 (%)

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Progress This Quarter:

(Includes project committee mtgs, work plan status, contract status, significant progress, etc.)

1. Field Study

- Field study has been continued in this quarter. The following fine-graded mixes projects were planned to be completed during this summer.

Source	Base	Project	Location	Status
Limestone	Strong	I-894	Milwaukee	Completed
Gravel	Strong	STH 60	Jackson	early July
Limestone	Weak	STH 21	Winnebago CL - STH 49	19 mm - Completed 12.5 mm – July 14

Gravel	Weak	USH 41 / Lannon Rd	Germantown	19 mm –Completed
		USH 8	Rhinelanders	12.5 mm - Pending July 9 – July 11

- Two coarse-graded mixes projects are also planned to be done during this summer, but project team members still could not identify project that include such mixtures. Contacts with districts and industry continued to identify projects.
- The following measurements have been collected from the field study:
 - Field Density by Nuclear Gauge
 - Field Permeability by NCAT device
 - Field Permeability by Air Permeameter device
- The following samples have been collected from the field study:
 - Nine of field cored samples were taken from each project
 - Loose mix samples were taken from each project in order to produce identical lab compacted samples.

2. Laboratory Study

- Laboratory testing for all samples from projects in Summer 2002 are completed.
- MU is in the progress of collecting data on laboratory of void pathways test, and air permeability test on field cored samples from projects in Summer 2002 and field cored samples that have been collected so far from projects in Summer 2003.
- Laboratory density test of field cored samples from projects in Summer 2003 has been completed.

Work Next Quarter:

- Complete all field projects by the end of Summer 2003.
- Start laboratory testing of all samples from field projects in this year.
- MU will finish void pathway testing and air permeability test for all cored samples.
- Analyze all data from 2002's projects.
- The meeting among the team members (UW-Madison, Marquette, and UW-Platteville) will be held regularly.

Circumstances affecting progress/budget:

The process of finding projects using coarse gradations is very difficult. Contact with industry indicates that private projects would have to be considered to test such mixtures.

Gantt Chart:

Note: Gantt chart shown in State Fiscal Year Quarters